SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 9.—"On the Geometrical Construction of the Oxygen Absorption Lines Great A, Great B, and α of the Solar Spectrum." By George Higgs. Communicated by R. T. Glazebrook, F.R.S.

In the early part of August, 1890, the photographic work of the normal solar spectrum which I had undertaken had been carried as far as great A, or the limit of visibility in the red, and to λ 8350, or beyond *z*, in the invisible regions.

During the two previous months of continuously dull weather, while classifying and comparing results, I was interested, on making a close examination of the head portion of the A line, to find, the rhythmical grouping, the harmonic order of sequence, and other characteristics of the B line repeated here in every detail.

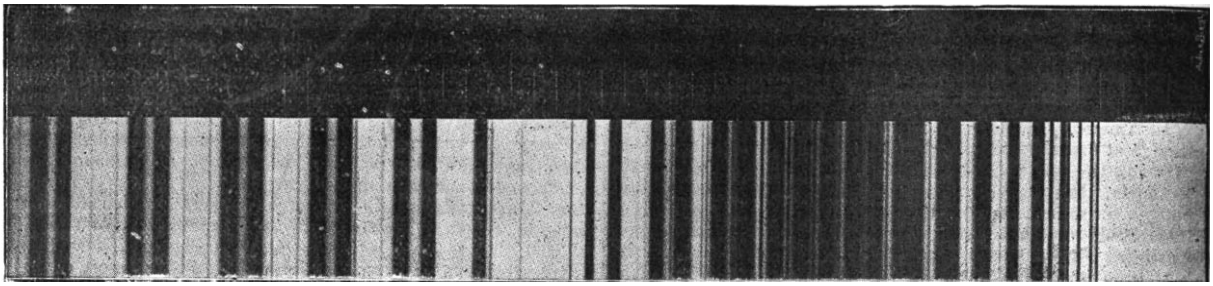


FIG. 1.

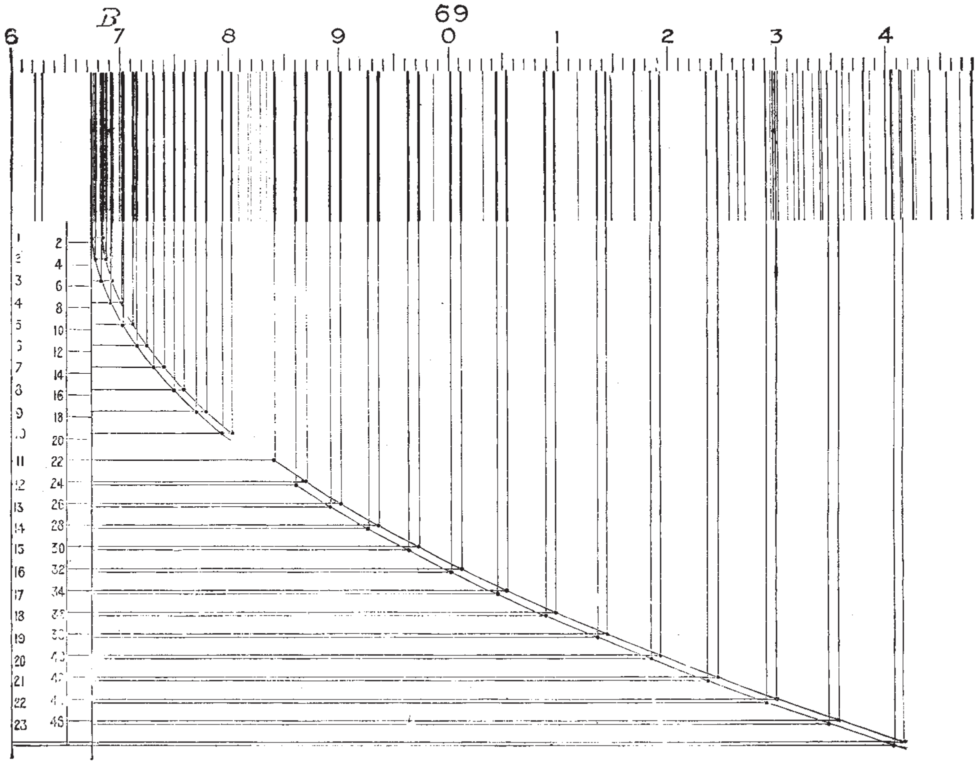


FIG. 2.

These two bands, together with alpha, are composed of a number of doublets or pairs, which approach each other on the more refrangible side with uninterrupted regularity, finally crossing, and at the limiting edges of all three bands the three last pairs overlap each other.

The differences of wave-length between the components of pairs increase in the same order.

These and other properties, which will be referred to, are still more obvious in the trains or flutings.

From its holding an intermediate rank in each of its distinguishing characters I was induced to adopt B as a typical group in a geometrical representation, and to investigate the subject by means of rectangular co ordinates.

Before a complete analysis could be made out, a micrometer had to be completed. This consisted of a platform, serving as a plate holder, which was made to travel on runners between parallel ways by means of a screw of such a pitch as to move the negative from one division of the scale to the next, for one revolution of the divided plate on the screw head, this latter being divided into 100 parts.

On and over the platform, a microscope is mounted with slide motions at right angles to each other; an index of glass fibre and reflector complete the apparatus.

Over 1000 measurements of nearly 200 lines have been made, 100 of which belong to great A, these together with the computed positions are contained in the Proc. Royal Soc.

In the analysis the axis of x is assumed to occupy a position coincident with, or parallel to, the scale of 1/10¹⁰ m. units, and the positions of the various lines are set off on this scale (see Fig. 2) for the group, which is divided into four series. Ordinates are then drawn in the position occupied by each line. The axis of y is divided into a number of equal parts, 1, 2, 3, n. Lines parallel to the axis of x, drawn from each of these divisions, intersect the respective ordinates. The continuous curve passing through the points of intersection is found to possess all the properties of a parabola.

Three points at least are selected to determine the position of the vertex and value of latus rectum. The distance from the origin along y is also found for an ordinate to the first line of a series.

Now, from the equation to the parabola $y^2 = px$, the formula $\lambda = V + \frac{(n+c)^2}{p}$ is derived, where V = the wave-length in 1/10¹⁰ m. units of a point in the spectrum coinciding with the vertex of the curve; p, the latus rectum; n, any number of units, reckoning from the origin; c, a constant.

In practice a representation more suitable for lantern projection being desirable, two units are taken on y for each line of the series; the equation then becomes $\lambda = V + \frac{(2n+c)^2}{L}$, where $L = 4p$, and c has twice its former value.

April 20.—"Magnetic Viscosity." By J. Hopkinson, D.Sc., F.R.S., E. Wilson, and F. Lydall.

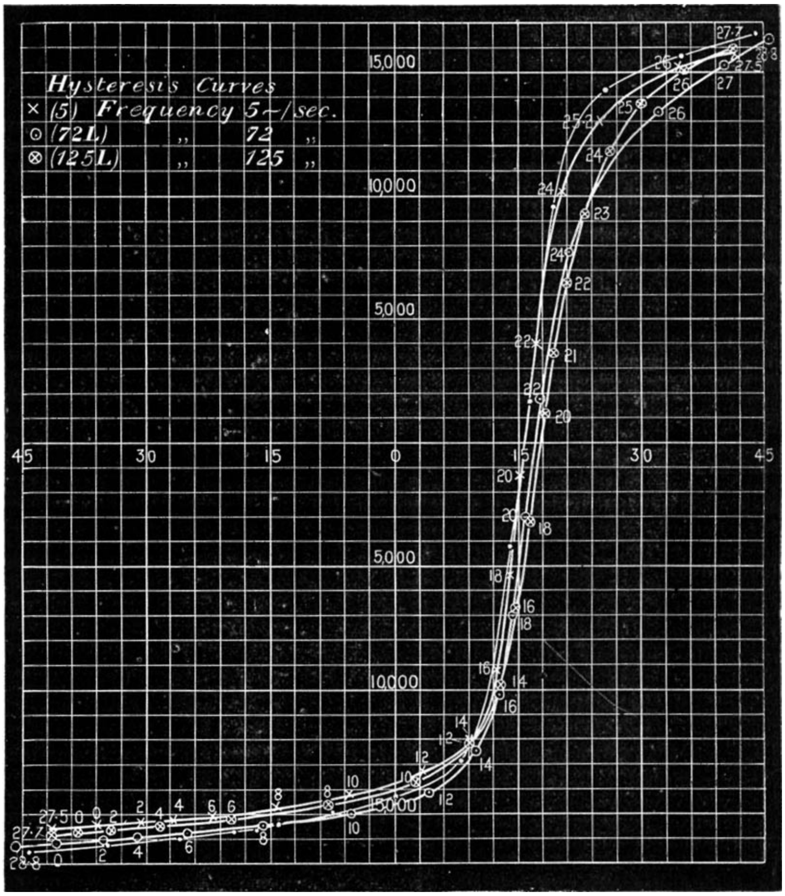
In some experiments carried out by Dr. J. Hopkinson and B. Hopkinson, an account of which appeared in the *Electrician* of September 9, 1892, it was found that when hysteresis curves were obtained for rings of soft iron and hard steel wire by means of alternate currents, and compared with curves taken with the ballistic galvanometer, in the cases where the induction was considerable, there was a marked difference which might be due to magnetic viscosity or to the ballistic galvanometer.

To settle this question the experiment was tried of completing the galvanometer circuit at known intervals of time after the magnetising force had been changed, and noting the deflection. The effect of the self-induction of the ring was approximately calculated, and found inadequate to account for the deflections obtained.

Next, the experiments previously alluded to were continued, and curves of hysteresis obtained with alternating currents of a frequency of 5, 72, and 125 v per second, the method of procedure being exactly the same. In all the curves thus obtained it was seen that the more rapid the change of magnetising force, the greater was the deviation from the curve taken with the ballistic galvanometer. The accompanying figure gives the hysteresis curves actually obtained, and show this point very clearly.

Similar experiments were carried out on hardened chromium steel, and the same effect was observed but was not so marked.

The following conclusions are drawn from the experiments:—(1) As Prof. Ewing has already observed, after sudden change of magnetising force the induction does not at once attain to its full value, but there is a slight increase going on for some seconds. (2) The small difference between the ballistic curve of magnetisation with complete cycles, and the curve determined with a considerable frequency which has already been observed is a true time effect, the difference being greater between a frequency of 72 v per second and 5 v per second, than between 5 v per second and the ballistic curve.



June 1.—"On the Metallurgy of Lead." By J. B. Hannay. Communicated by Sir G. G. Stokes, F.R.S.

In this paper the author deals with the result of seven years' researches on the metallurgy of lead.

It is shown that by repeated crystallisation any subsulphide of lead may be fractionated into metallic lead, and its monosulphide. The sp.gr. of pure monosulphide is found to be 7·766, and the methods of analysis are reviewed and corrected.

The reaction, $PbS + PbSO_4 = 2Pb + 2SO_2$, which was supposed to explain lead smelting, is shown to have no existence, as when lead sulphate and sulphide react upon each other, a volatile compound, PbS_2O_2 or $PbS.SO_2$, is formed which introduces complications, and being unknown to chemists was the cause of the errors in the accepted furnace reactions of lead.

This substance is formed whenever its constituents PbS, and SO_2, meet at high temperature, and is the cause of lead fume. Similar volatile compounds are formed by the gases CO_2, CO and H_2O. These bodies dissociate on cooling, but form colourless gases at a red heat.

All the furnace reactions of lead compounds are examined and corrected in the light of these discoveries, and the fact applied to explain the metallurgy of lead.

A new metallurgy is mapped out by which galena is treated in a Bessemer converter, and made into pig-lead, litharge, or sulphate of lead, in any proportions as may be desired, while all the silver is eliminated.

"Flame Spectra at High Temperatures. Part I. Oxyhydrogen Blowpipe Spectra." By W. N. Hartley, F.R.S.

The substances examined are supported in the oxyhydrogen flame on small plates of kyanite. This mineral contains ninety-six per cent. of aluminium silicate, and is practically infusible. The spectra were all photographed. The dispersion of the instrument being that of one quartz prism of 60°.

The spectra of a large majority of the metals and their compounds all terminate somewhere about the strongest series of water vapour lines in the ultraviolet. Typical non-metallic spectra are sulphur, selenium, and tellurium; the first yields a continuous spectrum with a series of beautiful fluted bands, the second a series of fine bands, occurring at closer intervals, and the third is characterised by bands still closer together and near the more refrangible termination of which four lines occurring in Hartley and Adeney's spark spectrum of tellurium are visible. Increase in atomic mass causes shorter periods of recurrence of bands. In line spectra it is the reverse; increase in atomic mass causes greater periods in the recurrence of lines. Charcoal and carbon monoxide yield chiefly continuous spectra; the latter, however, exhibits some carbon lines. The hydrocarbons yield the well-known spectrum of carbon bands with also those attributed to cyanogen. Of metallic elements, nickel, chromium, and cobalt yield purely line spectra; antimony, bismuth, silver, tin, lead, and gold beautiful banded spectra (spectra of the first order) accompanied by some few lines.

Iron and copper exhibit lines, and, less prominently, bands. Manganese has a beautiful series of bands and a group of three very closely adjacent lines. Aluminium gives a fine continuous spectrum with three lines, origin uncertain, zinc a continuous spectrum without lines, and cadmium a spectrum consisting of one single line only, λ 3260·2.

Of compounds, chromic trioxide yields a continuous spectrum with six lines belonging to the metal, copper oxide a fine band spectrum with two lines of the metal, magnesium sulphate gives a spectrum of magnesium oxide consisting of broad degraded bands composed of closely adjacent fine lines and one line belonging to the metal, λ 2852.

The sulphates of calcium, strontium, and barium give both bands of the oxides and lines of the elements. Phosphorus pentoxide yields a continuous spectrum with one peculiar line, seen also in the spectrum of arsenic.

The chlorides of the alkali metals give also lines of the elements with a more or less continuous spectrum, which, it is believed, is due to the metal in each case. Lithium chloride gives no continuous spectrum.

The Volatility of Metals.—One of the most interesting facts ascertained by this investigation is the volatility of all the metals examined, except platinum, and particularly the extraordinary volatility of manganese, and, to some extent, of the infusible metal iridium. Metal believed to be pure iridium is seen to have diminished after the flame has played upon it for about two hours.

Physical Society, May 26, Prof. A. W. Rücker, F.R.S., President, in the chair.—Mr. C. J. Woodward showed some experiments with a vibrating bar. On suspending the bar by two loops of cord, and placing it over a resonance box, the sound was greatly intensified. When placed crosswise, and partly over the box, a position could be found where no increase of sound resulted, whilst a little movement in either direction from this position caused a considerable increase.—The discussion on Dr. Lodge's paper, the foundation of dynamics, was then resumed. Communications on the subject from Mr. S. H. Burbury, Dr. G. Johnstone Stoney, and Prof. E. F. Herroun were read. Prof. Minchin said the first fundamental axiom of dynamics postulates the existence of *Force* as an entity distinct from *Matter*, *Space*, and *Time*, and this was the object of Newton's First Law. It also gave the criterion of the presence of force. To merely retain the law as defining *equal times* was to degrade it. As regards the supposed impossibility of defining uniform motion he said, similar difficulties occur in all sciences, even in geometry. Nevertheless a rational science of geometry existed. In dynamics we had notions of a right line and of uniform motion in it, although no criterion of either may exist. The fact that the science harmonises with ordinary experience constitutes its validity. In his opinion the extraordinary devices which had been suggested for defining directions fixed in space were unnecessary, and merely served to cover the subject with ridicule. He disagreed with Prof. Lodge in admitting the first law as a particular case of the second, for unless force was postulated (the function of the first law), the second became a mere definition, and not a law. Speaking of the third law he said the author had made a serious error in stating that it could be deduced from the first, for the centre of mass of a system might be at rest, without action and reaction necessarily being equal and opposite. The third law was not superfluous; neglecting it had led to great misconception and mystery about the Principle of Virtual Work, and D'Alembert's Principle, both of which are simple deductions from it. In opposition to Dr. Lodge, he defended the ordinary definition of Energy, and asserted that without the notions of *force* and *work*, the term *energy* loses all meaning. Speaking of transference and transformation of energy, he inquired if the proof given could be applied to the case of a body sliding down a rough rigid inclined plane, for here the stress (friction) does work on the body but not on the plane, and there was no transference. He regretted that the expression "potential energy" was used in different senses in the paper, sometimes meaning "static energy," and at others "the available portion of the kinetic energy of a body." Referring to the idea of all energy being ultimately kinetic, he asked if by accepting this the author meant to surrender the independent existence of force. If so, difficulties would arise; for example, in the kinetic theory of gases the expression for the pressure, $p = \frac{1}{3} \rho v^2$, was only arrived at by assuming the existence of force. The statement on the top of slip 9 about making a "moving body do work" was not necessarily true, as might be seen by considering the case of a sphere rolling down a rough inclined plane. Prof. O. Henrici thought axioms should be treated as true logical definitions, as for example in geometry, "two straight lines cannot enclose a space." Every new notion required its axiom. In passing from geometry to kinematics the idea of Time presented itself, and the appropriate axiom was contained in Newton's first law. On approaching dynamics Force and Mass were met with. He disagreed with Prof. Minchin in regarding force as most fundamental. Mass was more essential, for force might be abolished. On the other hand, he concurred with Prof. Minchin in thinking that the idea of a centre of mass was not axiomatic. Referring to Dr. Lodge's summary (NATURE, p. 62) he agreed with axiom (*a*) fully, and with (*b*) partially. Axiom 3 required further development. The crucial point, however, was axiom 4, "Stress cannot exist in or across empty space." This he regarded as very incomplete, and maintained that axioms defining the properties of the ether were necessary to further progress. If varieties of space be contemplated each advance required fresh axioms. Dr. C. V. Burton remarked that contact movement did not necessitate equal velocities; sliding motion was a case in point. Again, in deforming an incompressible fluid, although force and motion might exist, no work was done. Conservation could not be proved from denial of action at a distance. Speaking of the doctrine of transference and transformation of energy, he said it was a convenient working rule, but not true universally. Newton's laws were simple and consistent, but some doubt existed as to how much was definition and how much *law* or fact. Mr. Swinburne protested against the difference between theory and a working hypothesis being overlooked. All conceptions were based on experience, and ideas of ether and atoms derived from "jelly" and "cricket balls." We ought also to remember what "explanation" means, viz. describing the unfamiliar in terms of the more familiar. It was customary to describe the phenomena of fluids by reference to solids because we were more familiar with solids; an intellectual fish would probably do the reverse. The so-called "Theory of Magnetism" which breaks up a bar of iron into a number of small pieces, each possessing the properties of the original bar, he regarded as absurd. It was no "explanation" and not a "theory." Ether might be used as a working hypothesis, but must not be treated as an entity. Mr. Blakesley questioned whether transference of energy was always accompanied by transformation, and he did not see why energy should be looked upon as $(mv) \frac{v}{2}$, in preference to any other subdivision of the factors. As regards effects being proportional to their causes, he pointed out that the heating of an electric circuit, and thermoelectric action, followed laws not linear. Prof. S. P. Thompson, referring to the demonstration of the law of transference, &c., given on slip 8, said that attempts to translate it into Latin or Greek at once revealed the ambiguous character of the proof. Speaking of Ohm's law, he pointed out that R, a constant, was not an essential feature, as Dr. Lodge supposed. Ohm never said R was constant. In identifying energy, a difficulty presented itself, for one never came across it as a single thing but as a product, and in being transformed the paths of the two factors might possibly be different. Mr. Dixon said the whole of geometry and dynamics could be based on verbal definitions. The conservation of energy could be written as: Kinetic energy + potential energy = a constant, but on substituting the expressions for kinetic and potential energies, an identity resulted; therefore the original statement was not a law. Both the kinetic and potential energies of a system were functions of its configuration. Potential energy could not belong to a particle, but to a system. The president doubted whether Dr. Lodge's scheme was more simple, natural, and logical, than the ordinary one. The statement in NATURE (p. 62) that "strains were proportional to stresses" was simple enough, but it was questionable if "frequency of vibration is independent of amplitude" could be considered so. The author appeared to ignore *mass* in comparison with *force*, whereas the idea of *mass* seemed to be the more simple one. Dr. Lodge, in reply to Mr. Burbury, said two bodies never do attract one another; the thing which acted on either was the medium immediately in contact with it. Mr. Herroun had used metaphysical arguments against ether, but he (Prof. Lodge) thought it was a good thing to investigate ether. He agreed with what Prof. Minchin said about force and the first law of motion. *Force* was the more fundamental, but *mass* was best as a standard unit. As regards ether, he was prepared to say that it has no motion. It possessed electromagnetic kinetic energy, and probably all the stress energy that exists. Referring to the slipping body mentioned by Prof. Minchin and Dr. Burton he said that in speaking of the velocities of acting and reacting bodies being equal, he always meant that their velocities along the line of action were equal. The action between the sliding body and plane was a "catch and let go" one, like a fiddle bow and string. On the second laws of thermodynamics he hoped to say something in a subsequent paper. When he spoke of R being constant as the essence of Ohm's law he meant constancy as regards terms which appear in the equation $\frac{E}{e} = R$.

Linnean Society, June 1.—Prof. Stewart, President, in the chair.—Dr. J. Lowe gave an account of a newly-observed habit of the blackcap, *Sylvia atricapilla*, in puncturing the petals of certain flowers (*Hibiscus Rosa-sinensis* and *Abutilon frondosum*), specimens of which he exhibited, thus causing the exudation of a viscid secretion which proved attractive to insects upon which the bird preyed. The observations in question were made at Orotava, Teneriffe, during the month of March last.—By way of introduction to a paper by Mr. W. B. Hemsley on Polynesian plants collected by Mr. J. J. Lister, the latter gave an interesting account of the geology of the Tonga Islands, their volcanic nature, and the coral and limestone reefs with the soil formed chiefly of volcanic outpourings, on which dense patches of bush were growing. Referring then to the bird-fauna of the Tonga group, Mr. Lister compared it with that of Fiji and Samoa, and showed that it had no special affinity with the avifauna of New Zealand, and exhibited very little specialisation. Mr. Hemsley then gave an account of the plants collected there, as also in the Solomon Islands.—Mr. A. B. Rendle gave an abstract of a paper on fossil palms, in which his remarks were directed to a revision of the genus *Nipadites*, Bowerbank, and were illustrated by drawings of specimens from the London clay, Sheppey, from the Sussex coast, Selsey, Brussels, N.E. Italy, and elsewhere. The paper was criticised by Mr. Carruthers and by Mr. Clement Reid, who described the finding of specimens *in situ* at Selsey.—The secretary then read a paper by Dr. Baur on the temperature of trees, from observations taken in Colorado.—Mr. W. M. Webb gave an abstract of a paper on the mode of feeding in *Testacella*, illustrated by lantern slides prepared from original drawings of the living animal in various attitudes.

Royal Microscopical Society, May 17.—A. D. Michael President, in the chair.—Mr. G. C. Karop read a letter from Dr. R. L. Maddox on the subject of his rod illuminator. —A letter from Mr. W. H. Youdale, referring to some diseased beard-hairs, was also read by Mr. Karop.—Mr. C. Lees Curties exhibited and described a new form of camera lucida, made by Herr Leitz, of Wetzlar.—Sir David L. Salomons gave an exhibition with his projection microscope.—The President said they were extremely indebted to Sir David Salomons for the very admirable and interesting exhibition which he had given them, the value of which was not only on account of the defraction phenomena, which had been so well shown, but because of the advance which was indicated in the construction of the apparatus. He could not help observing, as the exhibition proceeded, that there was a remarkable flatness of field not generally seen under similar circumstances. There was one point on which he should like to ask for information; it sometimes happened that great concentration of light produced also a great concentration of heat, and that consequently objects in balsam, if exposed for too long a time, were apt to get spoilt through the softening of the medium. Was this difficulty got over in the present instance by using the electric arc light as an illuminant?—Sir David Salomons said he obviated it very much by using lenses cemented with balsam. The customary alum and water he found to be rather a trouble, and so he used simple distilled water, and found that it answered all the necessities of the case.

Zoological Society, June 6.—Sir William H. Flower, F.R.S., President, in the chair.—The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of May, 1893, and called special attention to a young Water-Buck (*Cobus ellipsiprymnus*), born May 4, 1893, being, so far as was known, the first antelope of this species that has been bred in captivity.—Mr. Walter Rothschild exhibited and made remarks on an egg of the Duckbill (*Ornithorhynchus anatinus*), taken from the pouch of the mother; the leg-bones and egg of an extinct bird of the genus *Æpyornis* from south-west Madagascar; and series of lepidopterous insects from Jamaica and from the Bolivian Andes.—Mr. Sclater exhibited and made remarks on some skins and skulls of mammals obtained in the Shiré Highlands by Mr. H. H. Johnston, Mr. B. L. Sclater, Messrs. Buchanan, and Mr. Alexander Whyte.—A communication was read from Messrs. F. E. Beddard and F. G. Parsons containing notes on the anatomy and classification of the parrots, based on specimens lately living in the Society's Gardens.—Mr. Sclater called attention to two front horns of an African rhinoceros belonging to Mr. F. Holmwood, which were stated to have been brought by native caravans from the district of East Africa, south of Lake Victoria Nyanza. They were remarkable for their great length and extreme thinness.—A communication was read from Mr. R. Lydekker containing an account of a collection of bird-bones from the miocene deposits of St. Alban, in the Department of Isère, France. The more perfect specimens were referred mostly to new species (*Strix sancti albani*, *Falcœortyx maxima*, *P. grivensis*, and *Totanus majori*), while others were regarded as undeterminable from their fragmentary condition. —Mr. G. A. Boulenger read a paper describing some new species of reptiles and batrachians, based on specimens lately obtained in Borneo by Mr. A. Everett and Mr. C. Hose.

PARIS.

Academy of Sciences, June 5.—M. de Lacaze-Duthiers in the chair.—Note on the works of Comte P. de Gasparin, by M. Th. Schlœsing.—Researches on iron of Ovifak, by M. Henri Moissan. Three specimens of native iron, discovered by Prof. Nordenskiöld at Ovifak, Greenland, were tested for any crystallised forms of carbon they might contain. The first specimen had a metallic lustre, and was nearly black. This was found to contain a small quantity of the kind of graphite which swells up in boiling sulphuric acid. It also contained ordinary graphite distinctly crystallised, which gave rise to graphitic oxide on being treated with potassium chlorate. Fused potassium bisulphate dissolved all the residue. The second specimen also had a metallic lustre, but a light grey colour, and weighed 18 gr. After treating with hydrochloric acid the residue showed fragments of schreibersite, an opaque white mass of irregular form, and a large number of highly refracting grains. On treating this residue with hydrofluoric and then with boiling sulphuric acid the volume of the carbon increased, showing the presence of swelling graphite. No ordinary graphite was found. The third specimen, which consisted of metallic globules disseminated through a stony matrix, left after treatment with the three acids a residue containing some fragments of blue sapphire, which could be picked out with the forceps. Amorphous carbon was contained in all the specimens, swelling graphite in two of them, and ordinary graphite in one. Neither black nor transparent diamonds were found in any of them.—On the genesis of natural phosphates, especially those which have derived their phosphorus from organised beings, by M. Armand Gautier.—On the multiplicity of homologous parts in its relation to the gradation of vegetable species, by M. A. Chatin. The multiplicity of the homologous organs of a given apparatus is a certain sign of organic degeneration. The more numerous the homologous parts, the more they deviate from the verticillary type of floral organs and approach the spiral type. Their reciprocal symmetry is also less regular, and their position less stable. This view is confirmed by other incontestable signs of degeneration found to go together with multiplicity of homologous parts, and is illustrated by corresponding gradation in the animal kingdom, where the myriapod is classed below the hexapod insect.—On the repeated application of Bernouilli's theorem, by M. Jules Andrade.—On problems of dynamics reducible to quadratures, by M. Paul Staeckel.—Sketch of a new theory of electrostatics, by M. Vaschy.—On some phenomena exhibited by Natterer's tubes, by M. Gouy.—Absorption of seleniuretted hydrogen by liquid selenium at high temperatures, by M. H. Pélabon. If selenium be melted in a tube containing hydrogen and then cooled, it is found to contain a large number of bubbles with a brilliant internal surface, which are absent in selenium fused in air. On reducing the mass to powder the characteristic smell of seleniuretted hydrogen is observed, and if the mass is broken up under water the latter is coloured red by the finely divided selenium liberated from the seleniuretted hydrogen by the oxygen of the air.—Organometallic combinations belonging to the aromatic series, by M. G. Perrier.—On the coccidia of the birds, by M. Alphonse Labbé.—On the Plankton of the Polar Sea, by M. G. Pouchet.—On pseudo-fecundation in the Uredinei and accompanying phenomena, by M. Sappin-Trouffy.—On two cases of parasitic castration observed in *Knautia arvensis*, Coulter, by M. Molliard.—On the sedimentary strata of Servia, by M. J. M. Lugovic.—On the eclogites of Mont Blanc, by MM. L. Duparc and L. Mrazec.—On the employment of vine leaves for feeding cattle, by M. A. Muntz. In the south of France sheep are often let into the vineyards after the vintage and allowed to strip the vines of their leaves. The vines do not appear to suffer thereby in the least. Fresh vine-leaves contain 67·0 per cent. water, 18·5 extractive matter, 3·8 nitrogenous matter, and 2·3 per cent. fatty matter. When dried, the proportions are: extractive matter, 51 per cent.; water, 15; nitrogenous matter, 11; cellulose, 8·5; and fatty matter, 5·5 per cent. In the various vineyards of southern France the amount of leaves per hectare (2·47 acres) varies from 2500 to 9500 kgr., or about the average yield of hay for the same area. Moreover, the leaves, instead of getting blown away by the wind and lost, are converted into manure by the cattle, and, in addition, the vine is much less sensitive to drought than the ordinary fodder crops.—On the effects of inoculation of human cancer or cancerous products upon animals; positive result in one case, by M. Mayet.—On the amplitude and mean duration of the extreme oscillations of the barometer at Paris, by M. Léon Descroix.—On the density and alkalinity of the waters of the Atlantic and the Mediterranean, by M. J. Y. Buchanan. Along the entire south coast of Spain the water was of the same density as the Atlantic. Eastwards of Cape Gata, where the eastward current is no longer active, the denser water of the Mediterranean set in. The mean ratio of salinity and alkalinity was 0·50 for the Atlantic, and 0·4875 for the Mediterranean, the difference being probably due to the abundance of calcareous rocks on the latter.

AMSTERDAM.

Royal Academy of Sciences, May 27.—Prof. van de Sande Bakhuysen in the chair.—Mr. Hubrecht gave a description of phagocytic and vasifactive processes by which the trophoblast of *Tupaja javanica* attacks the maternal uterine epithelium and prepares congested surfaces against which the area vasculosa and afterwards the allantois are applied. The placenta of Tupaja is double, and situated right and left of the fœtus. The trophoblast of Tupaja was furthermore compared to that of Sorex and of Erinaceus, in all of which it displays a considerable degree of activity. It was more rigorously defined as being the epiblast of the mammalian blastocyst, after deduction of what is intended for the formation of the embryo and for the internal coating of the amnion. In conclusion, certain phylogenetic speculations concerning the trophoblast were brought forward.—Mr. Schoute exhibited three new thread-models of developables related to higher algebraical equations. The first is the discriminant of the general cubic $u^3 + 3xu^2 + 3yu + z = 0$. It divides space into two parts, corresponding to points with 3 or 1 real roots. The ordinary twisted cubic forms its cuspidal edge. The discussion of the number of real roots situated between two given limits is facilitated by means of a certain tetrahedron. The second surface corresponds to the quartic $u^4 + 6xu^2 + 4yu + z = 0$. It divides space into three parts, containing points with 4, 2, or 0 real roots. By planes perpendicular to the x-axis it is cut in rational quartics with two cusps and one node. It possesses a parabolic nodal curve. And the third model realises the surface corresponding to the sextic $u^6 - 15u^4 + 15xu^2 + 6yu + z = 0$. It divides space into four parts, with points admitting 6, 4, 2, or 0 real roots. Any plane perpendicular to the x-axis meets it in a rational sextic curve with four cusps and six nodes. The cusps of the cuspidal edge are very remarkable points on this surface. In general the developable corresponding to a likewise mutilated equation of the nth order with three coefficients x, y, z, will show rational sections of the nth order with the planes perpendicular to the x axis, admitting $n - 2$ cusps and $\frac{1}{2}(n - 2)(n - 3)$ nodes, &c.—Mr. van der Waals gave a formula for the law of molecular force. By putting

$$-f\frac{e^{-\frac{r}{\lambda}}}{r}$$

for the potential of two material points, all the known laws of molecular action may be deduced. In this formula λ is a line equal to the quotient of La Place's H and K. This law may be explained by supposing (1) that the action of the point itself varies inversely as the square of the distance, (2) that the universal medium gradually does absorb the lines of force.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

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